

## Report

# Treatment of cellulite with LPG endermologie

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Funding sources: none

The author has no conflicts of interest to disclose.

Presented at *Congress of the European Masters in Aesthetic and Anti-aging Medicine*, Paris, on October 2005.

Reprints are not requested.

## Introduction

Cellulite describes the orange-peel or cottage-cheese-type dimpling of the skin frequently found on the thighs and buttocks of post-adolescent women.<sup>1</sup> There is no consensus regarding the etiology of cellulite.<sup>2,3</sup> Although numerous treatments including liposuction,<sup>4</sup> mesotherapy,<sup>5</sup> subcision,<sup>6</sup> laser,<sup>7</sup> and creams<sup>8</sup> are offered, there is little or no scientific evidence to support their efficacies.

LPG is an electrically powered hand-held machine that has two rollers and a vacuum chamber. This massage system provides positive pressure to the skin and subcutaneous tissue by rhythmic folding and unfolding between its rollers as well as negative pressure via aspiration.<sup>9,10</sup>

Louis Paul Guitay, a French engineer, was badly injured in a car accident in the 1970s. His body was burned and covered with scar tissue. During his long and painful recovery, he was prescribed massages to loosen the scar tissue and restore muscle function. These massage sessions took several hours each day, were labor intensive, and the outcome varied widely with the skill of the individual therapist. Guitay took his engineering expertise and designed a hand-held machine

## Abstract

**Background** LPG endermologie is a FDA-approved massage system in use worldwide for cellulite treatment that lacks clinical study.

**Objective** To determine the efficacy and safety of LPG endermologie in treating cellulite.

**Methods** Thirty-three healthy women (cellulite grades, 1–3 based on the 4-stage Nurnberger–Muller scale) had LPG treatments twice weekly for a total of 15 sessions. Clinical evaluation was performed by digital photography for cellulite grade assessment, and perimetric measurements of eight body sites for the evaluation of body contours.

**Results** Significant differences were found regarding mean cellulite grades before and after treatment. However, improved cellulite appearance occurred in only 5 women (15%). All patients showed a significant circumference loss at every measured body site. Weight losers had significantly greater loss of total and average body circumference than weight gainers.

**Limitations** Relatively small sample size and lack of more-objective methods for assessing treatment success.

**Conclusion** LPG endermologie is a well-tolerated and effective method for reducing the diameter of body circumference, however, it is mildly effective in reducing the cellulite grade and so, improving its orange-peel appearance.

bearing his initials, *LPG*. He also coined the term *endermologie*, derived from the words “ende” (meaning *under*) and “derm” (meaning *skin*). This mechanical system allowed the massage therapy to be performed more quickly and more consistently. Soon after, these machines were used to treat trauma and burn scars. During therapeutic use of the machine, physicians noticed that it had been able to reduce the appearance of cellulite. The manner by which this is accomplished is theorized to be by stretching the vertical connective tissues and stimulating the diminished lymphatic flow.<sup>9,10</sup>

After LPG endermologie was approved by the FDA for cellulite treatment, it gained worldwide popularity; however, scientific evidence supporting its efficacy remains scant.

Pressotherapy is a physiotherapy method that uses a pneumatic massager to perform sequential compressions in the direction of the circulatory blood flow, assisting venous return to the heart. It has been used to treat many diseases that cause vascular stasis and has been proposed as effecting better cosmetic outcomes when applied before or after a LPG session.<sup>11</sup>

This study was undertaken to evaluate the efficacy and safety of LPG endermologie with or without pressotherapy in the treatment of cellulite.

## Patients and Methods

### Study population

The study included 33 women seeking cellulite treatment (mean age,  $43.2 \pm 10.4$  years; range, 26–62 years; cellulite grade, 1–3 based on the 4-stage Nurnberger–Muller scale<sup>12</sup>) at the Cosmetology Unit of the Dermatology Department of Baskent University in Ankara, Turkey, between April 2004 and July 2005. Exclusion criteria were pregnancy; concomitant cellulite treatments; inflammatory or infectious skin diseases in the treatment areas; significant varicose veins on the lower extremities; and history of deep venous thromboses. This study was approved by our institutional review board, and all patients gave written informed consent prior to study participation.

### Study procedure

Each patient was treated with the LPG endermologie unit (LPG systems, Cedex, France) by the same well-trained LPG technician for 35–40 min. Treatments were performed twice weekly for a total of 15 sessions. All patients wore a special LPG suit covering their body except for the face and neck regions, the hands, and the feet. This suit protected the skin from suction and allowed the hand-held part of the machine to move easily on the body. After the first visit, endermogym – performed by applying the same massage while the patient contracts the muscles under the skin being treated – was added to the treatment sessions. With patients in the prone position, treatment was applied to the back of the upper arms and back and then to the gluteal region and posterior part of the legs. Then, patients turned to the supine position, and the abdomen and anterior parts of the legs were massaged. Lastly, by lying on each side, the waist and lateral and medial parts of the legs were treated. Treatments varied only in the intensity of negative suction pressure that was applied, and that intensity was determined by the patient's tolerance. Suction pressure intensity originally varied between 1 and 9, but our patients were routinely started with a pressure of 3, which was easily tolerated by all. As the sessions progressed, a maximum intensity of 7 was reached.

Seven of the 33 patients also wanted pressotherapy sessions after the LPG treatments. Pressotherapy sessions lasted 20 min. No specific diet or exercise plans were given to the patients, but they were advised to drink 1.5–2 l of water per day.

### Treatment evaluations

Cellulite grading was performed by analyzing digital photographs of the hips and thighs taken before and after the treatment sessions. After baseline and post-treatment photographs had been put together as a pair, the photograph pairs were reviewed and compared at the end of the study by a blinded dermatologist. Ten days later, a second analysis was performed to ensure intraobserver reliability. The photographs were graded according to the Nurnberger–Muller cellulite scale (0 = no alterations on skin, 1 = orange peel appearance by pinch test or muscle contraction,

2 = orange peel appearance at rest, 3 = orange peel appearance at rest plus raised areas and/or nodules).

Perimetric circumferential thickness measurements of eight body sites (i.e. arm, breast, waist, hip, subgluteal region, thigh, knee, and calf) were obtained before and after treatment. Measurements were obtained at a specific and consistent distance from an anatomic bony landmark to assure a consistent location, and total and mean changes in body circumference were calculated. Furthermore, a mean body circumference loss was determined for each area, and these eight parameters were then averaged into a mean index of average overall loss.

Results also were assessed subjectively by the patients who completed a questionnaire that assessed tolerability and efficacy of the treatment. At every visit, patients' weights and any adverse effects were recorded.

### Statistical analyses

Data are presented as means  $\pm$  SD. Pretreatment and post-treatment mean values for cellulite grades and perimetric circumferential thicknesses were calculated and then compared using the paired samples *t*-test. A value for  $P < 0.05$  was considered statistically significant.

Intraobserver agreement with regard to cellulite grades was determined from all samples (Kappa value, 0.945).

## Results

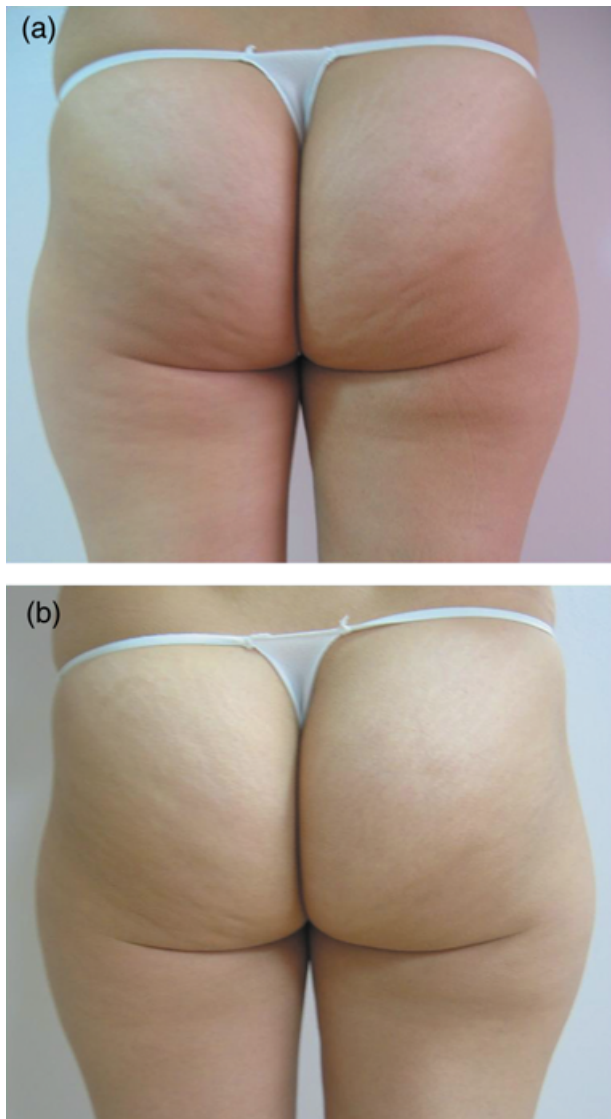
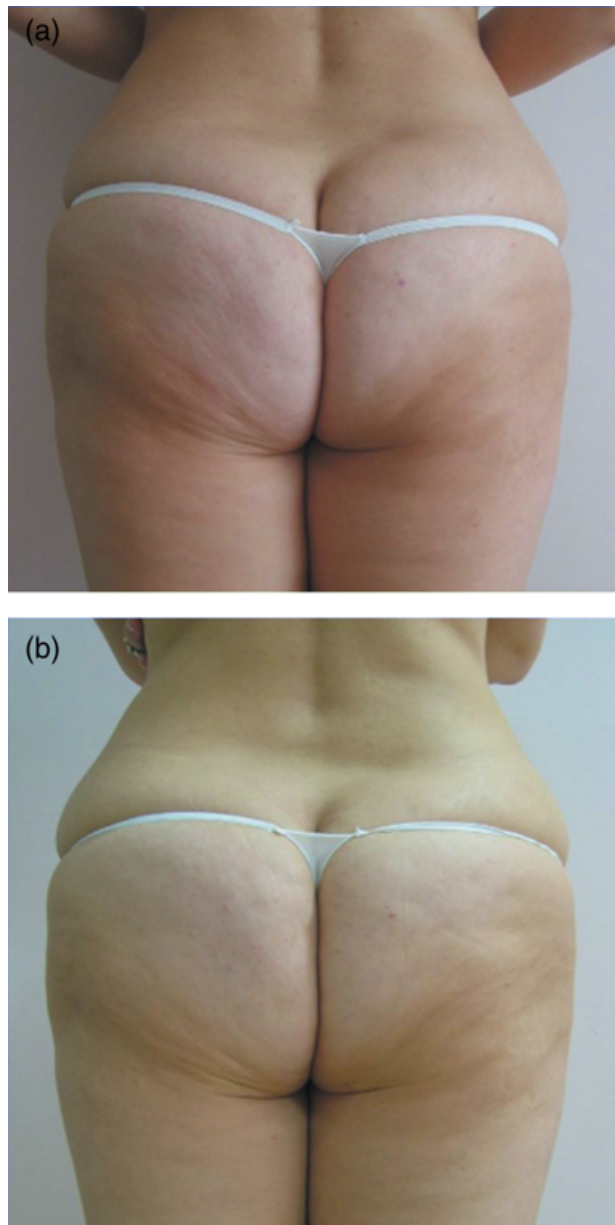
A statistically significant difference was found between the mean cellulite grades before and after treatment visits ( $1.94 \pm 0.7$  and  $1.79 \pm 0.7$ , respectively;  $P = 0.023$ ). However, only 5 of the 33 patients (15%) had a cellulite grade reduction at the end of the treatment; the grades of two patients were reduced to grade 2 from grade 3, and the grades of three patients were reduced to grade 1 from grade 2 (Table 1, Figs 1 & 2).

All the patients (100%) included in our study showed a circumference loss, and the mean body circumference loss was statically significant for every measured body site. Maximum mean circumference loss was obtained at the hips, whereas minimum loss was obtained at the calves (Table 2).

After completing all of the sessions, 20 patients had lost weight (mean loss,  $2980 \pm 2467$  g) and 13 patients had gained weight (mean gain,  $938 \pm 600$  g). The differences between the baseline and after treatment mean total body circumferences were statistically significant both in weight losers ( $n = 20$ ;  $542.15 \pm 49.3$  and  $516.40 \pm 44.1$ , respectively;  $P < 0.001$ ) and weight gainers ( $n = 13$ ;  $523.23 \pm 42.1$  and  $510.77 \pm 42.8$ , respectively;  $P < 0.001$ ). Furthermore, weight losers had a greater loss of both total and average body circumferences than the weight gainers. And these differences were statistically significant. Their detailed results are given in Table 3. Of the five patients who had cellulite grade reductions, three were weight losers.

**Table 1** Patient differences in cellulite grades after LPG treatment

	Pre-treatment (n = 33)	Post-treatment (n = 33)
Grade 0, n (%)	0 (0)	0 (0)
Grade 1, n (%)	9 (27.2)	12 (36.3)
Grade 2, n (%)	17 (51.6)	16 (48.4)
Grade 3, n (%)	7 (21.2)	5 (15.1)

**Figure 1** A 26-year-old woman: her mean circumference loss was 2.33 cm with a corresponding weight loss of 2400 g (a) Her cellulite grade was 2 before treatment, (b) it was 1 after treatment**Figure 2** A 37-year-old woman: her mean circumference loss was 2.77 cm with a corresponding weight loss of 2300 g (a) Her cellulite grade was 3 before treatment, (b) it was 2 after treatment

Seven patients also had pressotherapy sessions, whereas 26 patients did not want this treatment modality. For those who did or did not attend pressotherapy, no significant differences were found regarding total ( $n = 7$ ;  $20.4 \pm 12.1$  and  $n = 26$ ;  $20.6 \pm 11.5$ , respectively;  $P > 0.05$ ) or average ( $n = 7$ ;  $2.7 \pm 2.0$  and  $n = 26$ ;  $2.4 \pm 1.5$ , respectively;  $P > 0.05$ ) body circumference changes. Of the five patients with cellulite

Body area	Before treatment (mean $\pm$ SD, cm)	After treatment (mean $\pm$ SD, cm)	Mean loss (mean $\pm$ SD, cm)	P
Arm	28.7 $\pm$ 3.1	27.4 $\pm$ 3	1.2 $\pm$ 1.3	< 0.001
Breast	80.1 $\pm$ 8.4	76.6 $\pm$ 8.3	3.3 $\pm$ 2.3	< 0.001
Waist	78.6 $\pm$ 10.6	75.9 $\pm$ 10.1	2.7 $\pm$ 2.4	< 0.001
Hip	104.1 $\pm$ 9.1	100.3 $\pm$ 7.7	3.8 $\pm$ 2.7	< 0.001
Subgluteal	97.3 $\pm$ 7.3	93.5 $\pm$ 6.2	3.7 $\pm$ 3.5	< 0.001
Thigh	50.7 $\pm$ 6.1	48.4 $\pm$ 5.4	2.2 $\pm$ 1.9	< 0.001
Knee	37.3 $\pm$ 4.1	36.0 $\pm$ 3.8	1.3 $\pm$ 1.3	< 0.001
Calf	36.2 $\pm$ 3.7	35.1 $\pm$ 3.6	1.1 $\pm$ 0.9	< 0.001

**Table 2** Mean circumference loss of each body area after LPG treatment

	Weight losers (n = 20)	Weight gainers (n = 13)	P
Weight change (g, mean $\pm$ SD)	-2980 $\pm$ 2467	938 $\pm$ 600	
Total body circumference change (cm, mean $\pm$ SD)	-25.7 $\pm$ 10.9	-12.6 $\pm$ 7.0	0.001
Average body circumference change (cm, mean $\pm$ SD)	-3.07 $\pm$ 1.47	-1.74 $\pm$ 1.65	0.021

**Table 3** Differences for total and average body circumferences between weight losers and weight gainers

grade reductions, only one had pressotherapy in addition to LPG endermologie.

Although they had a reduction in body circumference, two patients (6%) were not satisfied with the cosmetic outcome of this therapy. However, nine patients (27.3%) eagerly wanted to continue having sessions once every 2 weeks for maintenance.

#### Adverse effects

One of the two recorded adverse effects was pain resembling a muscle ache lasting approximately 1 or 2 days after the session. This was noted in 11 patients (33%), although its severity did not interrupt any of the patient's attendance. Three of 33 patients (9%) had mild ecchymotic areas located primarily on the thighs and faded away in 10 days of time. These two adverse effects were mainly observed when the suction pressure intensity was 5 or over.

#### Discussion

Despite its worldwide popularity and FDA approval for the treatment of cellulite, scientific evidence supporting the efficacy of endermologie is lacking. There are only two studies,<sup>9,10</sup> both reported by Ersek and associates, that have focused on the effectiveness of this treatment. The first study<sup>9</sup> by the authors was a preliminary study in 1997, in which only 6 of 22 patients completed 14 treatment sessions. The second study<sup>10</sup> was reported in 1998. In it, records of 63 patients were added to the previous 22 patients for a total of 85 patient records. Of these 85 patients, 39 finished 14 LPG sessions, whereas 46 underwent only seven treatments. In these

studies, to evaluate the efficacy of LPG endermologie, only body circumference measurements were taken at five body sites (i.e. waist, hips, thighs, knees, and calves). Cellulite grading was not performed. Patients' weight fluctuations were correlated with body circumference changes, and a loss in the circumference measurement was seen in most of the patients regardless of weight change. When the two groups (those who had completed the 14 sessions, and those who had seven treatments) were compared with regard to mean body circumference loss, patients in the first group showed better results. The authors concluded that LPG endermologie is an effective means of fat mobilization and body contouring.

Another study<sup>13</sup> assessed and compared the effectiveness of LPG endermologie and aminophylline cream for the treatment of cellulite. In that study, 52 women were divided into three different treatment groups and completed a 12-week controlled trial. Group 1 received aminophylline cream to one thigh/buttock and a placebo cream to the other side. Group 2 had had endermologie treatment applied to one thigh/buttock. Group 3 was treated with endermologie to both sides and was given the same cream regimen as the first group (aminophylline cream to one thigh/buttock and a placebo cream to the other side). Morphologic assessment included body mass index, thigh girth at two locations, and measurement of thigh fat depth by ultrasound; however, cellulite grades were not assessed. No statistically significant differences were found for any of the groups regarding the measurements of the two legs. Given their results, the authors concluded that either of these two treatments was effective in treating cellulite.

In our study, only 5 of 33 subjects had a reduction in cellulite grade, although the difference in mean grades before and after treatment was statistically significant. However, all of our patients experienced a loss in body circumference. We found that weight loss and body circumference loss were interrelated. One could argue that circumference loss may depend solely on weight loss; however, even our subjects who did not lose weight demonstrated a significant reduction in their total and average body circumference measurements. These results confirm the findings of the study by Chang and associates<sup>10</sup> in which 75% of the patients who gained weight after 14 treatment sessions showed a loss in mean body circumference.

Patients in the current study tolerated the treatment sessions without difficulty, serious adverse effects that could interrupt patient attendance were not seen. Most patients concluded that overall, the treatments were relaxing, even if slight discomfort was felt on sensitive body parts like the inner thighs.

To the best of our knowledge, no study has evaluated the efficacy of pressotherapy for the treatment of cellulite. Only seven of our patients wanted to have pressotherapy in conjunction with LPG, as it required additional time and money. When those who attended pressotherapy were compared with those who did not attend pressotherapy, no statistically significant differences were noted, and so our preliminary results about pressotherapy are not encouraging.

The etiopathogenesis of cellulite remains obscure, and there is no definite explanation for its presentation. The four leading hypotheses regarding the physiology of cellulite are sexually dysmorphic architecture, weakened connective tissue septa (which allows for fat herniation), decreased vascular flow, and inflammatory factors.<sup>2</sup> The effect of endermologie rests on the theory that cellulite is the result of impaired circulation and decreased lymphatic drainage.<sup>14</sup> It has been suggested that this effect is not long lasting and thus, maintenance therapy is advised as once biweekly for the first 2 months and then once a month for the subsequent 4 months. However, none of these recommendations is evidence-based, and it is not known how long the beneficial effect of endermologie really lasts.

There are no standardized criteria to assess the improvement of cellulite<sup>2</sup>. As self-assessment is not a reliable objective criterion, we preferred taking digital photographs before and after treatment visits to evaluate the cellulite grades, thus we were able to observe any improvement in cellulite appearance. The three previously mentioned authors<sup>9,10,13</sup> did not perform such an assessment. Instead, they performed circumference measurements of the selected body sites. We had these measurements as well and used them to determine improvements in body contours. On the other hand, we believe that ultrasound<sup>15</sup> and magnetic resonance imaging<sup>16</sup> that allow evaluation of subcutaneous tissue should be added

to these methods for more accurate assessment. In subsequent studies, we intend to include these tools to reach a more reliable conclusion regarding the efficacy of LPG endermologie for the treatment of cellulite.

The potential limitations of the present study are the relatively small sample size (particularly for evaluating pressotherapy) and the lack of more-objective means of assessing treatment success. Another potential limitation is our lack of follow-up to determine how long the beneficial effects of LPG endermologie last.

In conclusion, LPG endermologie is a well-tolerated and an effective means of reducing the diameter of body contours, even in patients who do not lose weight. However, it is mildly effective in improving the appearance of cellulite, and pressotherapy does not seem to provide any additional benefit to LPG endermologie.

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